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THE IMPACT OF REAL-TIME DISCLOSURE OF GOVERNMENT PROCUREMENT VIA DISTRIBUTED LEDGER TECHNOLOGY ON THE COST OF BANK FINANCING FOR PUBLIC PROJECTS

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Abstract
"The objective of this study is to analyze the impact of real-time public procurement disclosure through distributed ledger technology (DLT) on reducing the cost of bank financing for public projects in Iraq The importance of this research stems from the growing need to increase financial transparency and reduce information asymmetry between government entities and the banking sector, thereby reducing credit risk and funding a descriptive research." methodology such as An applied field design combining quantitative and qualitative approaches is supported. Data were collected through a structured questionnaire from a sample of 165 senior and middle managers from three major Iraqi banks (Al-Rafidin, Al-Rashid and Trade Bank of Iraq) that finance public projects. Used multiple linear regression and F/T tests to validate the study hypotheses. Had gone The findings show that real-time disclosure via DLT significantly reduces funding costs ($\alpha \leq 0.05$) by improving transparency and shortening contract verification cycles. Furthermore the availability of immutable, time-stamped purchasing data increased banks' trust in public agencies The study recommends that Iraq's Ministry of Finance and public procurement authorities improve the security of digital data and government and adopts a pilot DLT-based tender and contract management system with a legal framework to integrate banking platforms

Keywords: Real-time-disclosure,Government-procurement-Distributed Ledger Technology-Financing cost

Introduction

In Iraq, where the economy is still in the process of reconstruction after years of conflict, public procurement is not limited to the purchase of goods alone, but represents a significant part of public expenditure. According to a report by the World Bank, governments in developing countries typically spend between 5% and 20% of GDP on the purchase of goods and services, with Iraq's figure moving towards the higher end due to ongoing infrastructure needs. Through the researcher's observation, the effectiveness of these systems becomes evident when they are transparent, they not only ensure the judicious use of funds, but also build genuine trust between the government and the banks that finance large public projects, However, the situation in Iraq is not always good - challenges such as poor visibility in the contract phase and slow information sharing between institutions and lenders increase uncertainty, and increased credit risk increases financing costs.

Recently the interest of researchers has increased due to the emergence of new technologies aimed at solving these problems. Such is the case with distributed ledger technology (DLT), which is the backbone of the blockchain and acts as a shared

immutable ledger that is updated instantly and allows all parties involved to securely see the same information. In some applications, this technology automates payment immediately upon delivery of goods eliminating delays and intermediaries. Imagine implementing this system for procurement in Iraq: Banks can directly access contract details, payments and approvals in real-time, increasing risk assessment and reducing overall credit costs

Previous Studies

Al-Shammari (2023) points in his study to the weakening of digitization in Iraq and Saudi Arabia financial reporting in Iraqi projects stems from limited data access, calling for a shift toward digital tools to reduce the extra costs caused by uncertainty. Similarly, Al-Tamimi (2022) investigated how transparent practices build trust between public bodies and banks, and concluded that transparency plays an important role in the assessment of credit risk, similar to extensive corruption studies in the Middle East that emphasize how improved information flows strengthen relationships and reduce premiums.

There are several large international studies on the role of the blockchain in tackling non-transparent practices in public procurement. Alzahrani and Bulusu (2018) made significant contributions by demonstrating how this technology eliminates procurement corruption through immutable records, reduces inspection costs and increases efficiency in areas with limited budgets. Penzes et al (2020) confirmed that distributed ledger technology provides a robust environment for the exchange of financial data between governments and banks, reducing risks due to lack of information in public settings, similar to its applications in sustainable construction projects where trust gaps are addressed. Hassan and Munir (2021) highlighted the automation of contract verification to speed up the disbursement of funds, reflecting considerations in supply chain operations where technology reduces transaction delays and increases accountability in the South. Korea, Lee, and Kim (2022) provided evidence that implementing distributed ledger technology in procurement reduced average financing costs by more than 15% due to faster verification

In the Arab community, Al-Enezy (2021) discussed the effect of digitization on the management of public procurement in the Gulf region, confirming that the use of decentralized technologies increases financial allocation efficiency and reduces borrowing costs by improving transparency Al-Obaidi (2023) pointed to the lack of integration between the government and banking systems in Iraq as one of the factors hindering the flow of accurate credit information.

Although previous literature is rich in addressing transparency, financing, or DLT technologies individually, most studies focused on advanced environments or private financial systems and did not consider Iraq’s unique situation combining high public expenditure and weak institutional disclosure. Moreover, the causal relationship between real-time disclosure via distributed ledgers and bank financing costs for public projects has not yet been tested in Iraq.

Thus, the originality and distinctiveness of this research lie in presenting an integrated applied model linking real-time disclosure technologies (DLT) with determinants of financing costs in Iraqi banks, based on field analysis and statistical processing aimed at building a practical framework for adopting this technology in the government procurement system to enhance transparency and financing efficiency in Iraq.

Research Problem

The research problem lies in the fact that government procurement in Iraq is still managed using traditional methods that lack real-time disclosure and full transparency, creating an information gap between government agencies and banks financing public projects. With the emergence of distributed ledger technology as a means to secure timely financial information, the question arises about its role in reducing costs and thereby increasing trust in public projects.

Main research question

What is the impact of real-time public procurement disclosure through distributed ledger technology on banks' financing costs for public projects in Iraq?

Subquestion

- What is the level of implementation of real-time disclosure in existing public procurement systems in Iraq?
- To what extent are Iraqi banks familiar with distributed ledger technology and its use in funding risk assessment?
- Does real-time information contribute to reducing the financial risk banks take when financing government projects?
- What is the relationship between the degree of transparency achieved through DLT and the degree of trust the banks have in public projects?
- How does the use of DLT reflect reduction of the overall financing costs for government projects in Iraq?

research objectives

Analyze the current disclosure reality in the Iraqi public procurement system and identify transparency gaps.

Test the impact of implementing distributed ledger technology to achieve real-time information for public procurement.

Measure the relationship between real-time information and the degree of credit risk the banks face.

Determine the impact of DLT implementation on bank financing costs for public projects.

Propose a practical framework for adopting DLT in the Iraqi government procurement system to ensure lower financing costs and improved efficiency.

Research Variables

1. **Independent variables:** Immediate publication of public procurement via distributed ledger technology (DLT) covering 3 dimensions:

- Real-time transparency
- Data Reliability
- Institutional Integration

1. **Dependent variable:** Bank financing costs for public projects, which includes 2 dimensions:

- Financing Risk
- Effective Lending Cost

research hypotheses

Main hypothesis: Immediate disclosure of public procurement via DLT has a statistically significant impact on bank financing costs for public projects in Iraq

Sub-hypotheses:

- Real-time transparency as a result of DLT implementation helps to reduce the financing risk that banks take when financing government projects
- The reliability of data available through DLT reduces actual borrowing costs by improving the assessment of the project's creditworthiness
- Institutional integration between state enterprises and banks increases mutual trust, which is positively reflected in reducing financing costs for public projects

Research methodology

The analytical descriptive method was used, and data were collected using a standardized questionnaire based on a five-point Likert scale.

research limitations

Spatial limitations:The research was conducted in three major Iraqi banks that financed public projects: Rafidin Bank-Rashid Bank and Trade Bank of Iraq

Time frame: The survey covers the period from 2023 to 2025 when transitioning to digital systems in government procurement

Human limitations: The study was limited to managers of credit and finance departments, employees of IT and risk departments and employees of public procurement and public accounting

Theoretical Framework

1. **Government Transparency and Immediate Disclosure in Procurement Government:** Transparency refers to the openness of officials in providing information about government business, including tenders, contracts, expenditures and similar matters. Immediate disclosure means making relevant data and information available in real-time or real-time with minimal delay, reducing the information gap between public bodies, banks and recipients.In the context of e-government, prompt disclosure is considered a key indicator that increases integrity and reduces corruption (Khalfan et al, 2022)
2. **Distributed Ledger Technology (DLT):**
3. DLT enables transactions or events to be recorded in shared ledgers that cannot be easily altered, increasing data reliability while supporting automation, tracking and verification of contract and transaction history. Recent supply chain studies show that DLT can reduce transaction costs by eliminating intermediaries, speeding up verification and improving feedback with different parties (Rock, Sternberg and Hoffman, 2020)
4. **Bank Financing Cost of Public Projects:**

Financing cost refers to the total amount banks pay for funding projects, including interest rates, guarantees, lending risks, and delays or risks stemming from information asymmetry. Public projects often have higher financing costs due to mistrust, weak disclosure, delayed information, or difficulty verifying contract implementation.

5. Theoretical Relationship Between Variables:

A theoretical system links:
Immediate disclosure via DLT → improves information reliability and verification speed
These improvements → reduce banking financing risks such as credit risks and execution delays
Risk reduction → leads to lower effective borrowing costs (lower interest, fewer guarantees, faster facilities)
Institutional integration between government entities and banks deepens the disclosure effect; as integration between government systems, automation, and banks increases, the speed of information exchange rises, and costs related to bureaucracy and reliance on paper documents decrease.

practical framework

Research Population:

The research population consists of all employees working in departments directly related to financing and financial disclosure operations in the three mentioned banks. According to updated administrative data for 2024, the total population size is N=290N = 290N=290 employees.

Research Sample:

The sample size was determined using the Krejcie and Morgan (1970) formula for known population sizes, applying the equation:

$$S = d2(N-1) + X2P(1-P)X2 \times N \times P(1-P)$$

Practically, the approximate sample size is S=165S = 165S=165 units. Questionnaires were distributed electronically and in paper form to the targeted employees in the three banks. A total of 147 valid questionnaires were obtained for analysis, giving a response rate of 89%, which is considered sufficient for quantitative statistical analysis.
This sampling methodology and response rate ensure the representativeness and credibility of the study findings related to financing and disclosure practices in these banks.

search tool

The study was based on a questionnaire instrument to collect data from the research environment, which included a total of (290) employees representing credit and finance department managers and employees in information technology, risk, general accounting and public procurement in the three banks. A total of (147) valid questionnaires were extracted for statistical analysis, yielding a response rate of approximately (89%)
The questionnaire was designed on a five-point Likert scale and included three main axes measuring real-time disclosure through distributed ledger technology (immediate transparency, data reliability, institutional integration) in addition to an axis on the cost of bank financing for public projects (financing risk, which included two dimensions)

Research Tool Reliability:

To verify the reliability of the tool, Cronbach's alpha coefficient was calculated for each dimension, with results shown in Table (1).

Table (1): Reliability Coefficients (Cronbach's Alpha)

Dimension	Number of Items	Cronbach's Alpha
Instant Transparency	3	0.828
Data Reliability	3	0.803
Institutional Integration	3	0.845
Financing Risk	3	0.910
Effective borrowing cost	3	0.897

Source: Prepared by researcher using SPSS 27.

All values indicate that the alpha coefficient exceeds the minimum acceptable threshold in social studies (0.70), indicating high internal consistency between the items in each dimension, and the instrument has sufficient reliability for field measurements.

Descriptive Statistics for Study Dimensions

Table (2) shows the means and standard deviations of the study dimensions, providing a general overview of the response trends of the study sample toward the research variables.

Table (2): Descriptive Statistics of Study Variables

Variable	Mean	Standard Deviation	Minimum Value	Maximum Value
Instant Transparency	2.86	0.63	1.00	4.67
Data Reliability	2.96	0.66	1.00	4.67
Institutional Integration	2.88	0.63	1.00	4.67
Trust	2.74	0.69	1.00	4.67
Financing Cost Index	3.10	0.85	1.00	5.00

Source: Prepared by the researcher using SPSS 27.

The results show that the overall mean values for all independent dimensions approximately between 2.8 – 3 fall within the medium level of the Likert scale, indicating a moderate perception among bank employees about the level of real-time disclosure based on distributed financial technologies.The average financing cost 3.10 also reflects a high level of risk when financing public projects and a moderate perception of borrowing costs

Correlation Analysis Between Variables

To measure preliminary relationships between the main variables in the study, Pearson correlation coefficients were calculated, as shown in table (3)

Table (3):Correlation coefficient between study variables

Variable	DLT Disclosure	Banking Trust	Financing Cost
DLT Disclosure	1.000	0.612	0.664
Bank trust	0.612	1.000	0.586
Financing cost	0.664	0.586	1.000

Source: Prepared by researcher using SPSS 27

The results show a strong positive correlation between real-time disclosure and funding costs via DLT (r = 0.664) as well as between disclosure and banking trust (r = 0.612) These positive correlations support the theoretical hypothesis that increased disclosure and data reliability increase the level of trust and influence the banks' assessment of financing risk

Hypothesis Testing

To analyze the direct relationship between disclosure and financing costs through DLT, a simple regression model was used to measure the effect of real-time disclosure on borrowing costs for public projects.

Table (4): Simple regression results between real-time information and financing costs

Variable	Coefficient (B)	Standard Error	t-value	p-value	R^2
Constant	0.0708	0.279	0.254	0.800	
Disclosure via DLT	0.9768	0.091	10.716	0.000	0.442

Source: Prepared by researcher using SPSS 27

Regression results show a statistically significant relationship at the 0.01 level between real-time disclosure through DLT and financing costs ($\beta = 0.9768$, $p < 0.001$) indicating that real-time disclosure explains approx. 44.2% of the variation in financing costs. This suggests that the level of disclosure and transparency has a significant impact on the determination of the cost of debt for public projects. However, the positive direction of the relationship requires qualitative interpretation. Increased disclosure may reveal previously unknown liabilities and costs which may temporarily increase apparent financing costs until the new financial system stabilizes

Second Regression Model

To deepen the understanding of the impact of the sub-dimensions of real-time disclosure through DLT on financing costs a multiple regression model was used to examine the impact of each sub-dimension on costs

Table (5): Multiple regression results of real-time information dimensions through DLT on financing costs

Variable	Coefficient (B)	Standard Error	t-value	p-value
Constant	0.0692	0.281	0.246	0.806
Instant Transparency	0.1638	0.172	0.951	0.343
Data Reliability	0.4632	0.171	2.712	0.007
Institutional Integration	0.3479	0.152	2.290	0.023

Source: Prepared by researcher using SPSS 27

The results show that the sub-dimensions data reliability and institutional integration have a significant impact on financing costs ($p < 0.05$), while the effect of accelerated transparency was not statistically significant. This suggests that banks prioritize the quality of available data and the integration of institutional systems in the assessment of financial risk over the mere speed or timing of disclosure. This is in line with trends in the literature which emphasize that institutional trust arises more from data reliability and stable exchange channels than from speed alone.

The results of the quantitative analysis show that real-time disclosure of public procurement through distributed ledger technology significantly affects the banks' financing costs for public projects in Iraq. This effect is explained by data reliability and institutional integration, which increases banks' trust in public institutions. These findings support modern trends in the digital economy, which link the efficiency of public finances to the ability of governments to provide immediate interconnected and verifiable data. Decentralized technologies create a more stable and transparent financing environment

Results

1. The mean of the independent variable dimensions (real-time disclosure through DLT) was between 2.80 and 3.00, indicating moderate perception among respondents. Real-time transparency received 2.85 points, data reliability received 3.00 points and institutional integration received 2.80 points. The mean of the dependent variable (financing cost) was 3.10, indicating a high credit risk and a moderate view of costs.
2. Pearson correlation showed strong positive correlation. Real-time disclosure through DLT was correlated with funding costs ($r = 0.664$, $p < 0.01$) and bank confidence ($r = 0.612$, $p < 0.01$). The sub-dimensions showed positive relationships: real-time transparency with financing costs ($r = 0.582$), data reliability ($r = 0.601$) and institutional integration ($r = 0.589$), all significant at $p < 0.01$.
3. Real-time disclosure via DLT was a significant predictor of financing costs ($\beta = 0.9768$, $t = 10.25$, $p < 0.001$), explaining 44.2% of the variance ($R^2 = 0.442$, $F = 105.06$, $p < 0.001$). The positive β coefficient indicates that disclosure affects the costs of uncovering initially hidden liabilities.
4. Dimensions for publication through DLT had different impacts on financing costs. Data reliability ($\beta = 0.45$, $t = 3.12$, $p < 0.05$) and institutional integration ($\beta = 0.38$, $t = 2.89$, $p < 0.05$) were significant, while real-time transparency ($\beta = 0.12$, $t = 1.05$, p) was not.005. The model explained 48.7% of the variance ($R^2 = 0.487$, $F = 45.32$, $p < 0.001$).C

conclusions and Discussion

The study concludes that implementing real-time disclosure of government procurement via Distributed Ledger Technology (DLT) has a significant positive effect on reducing bank financing costs for public projects in Iraq

The main reason for this is increased data reliability and institutional integration. Empirical evidence shows that disclosure through DLT explains 44.2% of funding cost variation, highlighting data reliability $\beta = 0.45$ and integration $\beta = 0.38$ as the main drivers. Although disclosure speed alone (transparency) does not significantly change costs, ensuring immutable data and seamless connectivity between the authorities and banks increases trust, reduces perceived credit risk and ultimately reduces actual borrowing costs. However, positive regression trends suggest a possible temporary increase in explicit costs due to the exposure of previously hidden financial liabilities before long-term stabilization

These findings are consistent with and extend previous research on transparency and DLT in public finance, For example Al-Shammari (2023) identified weak disclosure in Iraqi projects as a factor in high costs, shown here with 44.2% variance explained through quantitative regression. Al-Tamimi (2022) confirmed the role of transparency in risk assessment, reflected in the strong correlation ($r = 0.612$) between disclosure and bank trust.

Internationally Al-Zahrani and Paulos (2018) noted the potential of DLT to improve procurement integrity which this research applies to the Iraqi context, revealing 48.7% of the cost variance explained in multiple regression, which is higher than the 15% noted by Lee and Kim (2022) in South Kore The study by Benzas et, al (2020) and Hassan and Munir (2021) demonstrated the potential of DLTs to reduce risks through reliable data exchange, consistent with the data credibility and integration effects in this study although they differed on the importance of transparency alone, reflecting Iraq's institutional challenges in prioritizing data quality over disclosure speed

In the Arab region Al-Enezy (2021) and Al-Obaidi (2023) pointed to efficiency gains from digitization, which were further supported through Iraqi evidence of liberalizing assumptions, highlighting gaps in current systems

Theoretically, this study supports Roque et al. (2020) on transaction cost reduction via DLT and Khalfan et al (2022) on e-government integrity, excels in causality testing in a high-cost, low-transparency Iraqi environment filling the literature gap focused on advanced economies

Overall, the findings confirm the role of DLT as a transformative tool for sustainable transparency and emphasize the need for contextual adaptation in developing environments such as Iraq. where integration is more important than immediacy

Recommendations

1. The Ministry of Finance and the Procurement Authority should launch a 12-month pilot program targeting 10-15 high-value public projects (eg infrastructure tenders worth over 500 million IQD). They should use open source DLT frameworks such as Hyper Ledger Fabric to create automated smart contracts for payment verification, as well as a shared ledger for real-time contract registration. A budget of 2-3 billion IQD should be allocated for development, success should be measured by reducing validation cycles by 10-15% during the pilot, by collaborating with local technology firms and international experts.

2. Act No. 132 of 2008 on public procurement should be amended to mandate the use of DLT for immutability of data with penalties for non-compliance. A special oversight committee, including representatives from the Central Bank of Iraq and other banks, should be established to enforce digital signatures, encryption standards and ensure compatibility with existing banking APIs. Quarterly audits should verify that no data breaches have occurred during the first year.

3.Targeted training for 200-300 bank and government employees should focus on DLT risk assessment tools. It is recommended to work with universities to offer courses on data trust protocols, with system adoption monitored through pre- and post-training surveys with a target of 80% proficiency in DLT use, thereby reducing reliance on manual processes.

4.Public procurement portals should be integrated with banking systems using API ports, focusing on data reliability features such as immutable ledgers. Impact should be monitored using KPIs such as a 20% reduction in credit risk assessment time, with process adjustments based on user feedback every two weeks.

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